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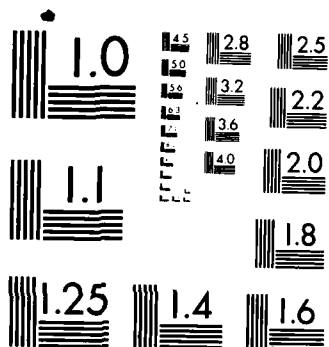
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WSSC SYSTEM INPUTS: THE WEAPON SYSTEM
COST RETRIEVAL SYSTEM (WSCRS), H036C

by

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EXECUTIVE SUMMARY

This volume documents the findings of a study conducted by Desmatics, Inc. for the Office of VAMOSC, HQ AFLC/MML. This study is an assessment of the Weapon System Cost Retrieval System (WSCRS), Data System Designator (DSD) HO36C. WSCRS is the source of aircraft depot maintenance and consumption spares cost information used by the Weapon System Support Cost (WSSC) subsystem of VAMOSC, the Air Force Visibility and Management of Operating and Support Cost System (DSD D160C).

This study is a follow-on to Desmatics' validation and verification of the WSSC system cost allocation algorithms. The objective of the current effort is to determine the appropriateness of the WSCRS data to the VAMOSC system, and to assess the impact on VAMOSC outputs of any limitations in the HO36C data.

The WSCRS system provides to WSSC an annual summary file of depot maintenance and consumption spares costs by Mission Design Series (MDS) and Work Breakdown Structure (WBS). The costs in WSCRS are developed based on data extracted from other Air Force data systems. The WSCRS system must employ various cost allocation methods to arrive at MDS-level costs. This is because the data inputs to WSCRS do not report at the MDS level; rather, most of the data is for lower-level components of an MDS. Desmatics has found the procedures used by WSCRS for cost calculation and allocation to be intuitively reasonable and valid.

In Desmatics' opinion, the WSSC system is not providing a complete portrayal of the total cost of aircraft depot maintenance. This results from the fact that the WSSC system selects from the WSCRS file only those costs which are funded by the Depot Maintenance Industrial Fund (DMIF). The remaining costs which are tracked by WSCRS (and bypassed by WSSC) are those which are not covered by the DMIF, but are paid from command-level funds; such costs are known as "unfunded" costs. Desmatics believes that both DMIF-funded and unfunded costs should be included in WSSC to give a complete depiction of depot maintenance costs.

The Office of VAMOSC has proposed a method to provide the separate visibility of modification labor costs desired by the Cost Analysis Improvement Group (CAIG). In Desmatics' opinion, this method has several drawbacks, and therefore Desmatics has proposed an alternative method of obtaining this cost visibility. The method suggested by Desmatics would make use of WSCRS data, rather than establishing a new interface, as would be required under the Office of VAMOSC method.

Desmatics recommends the elimination of two WSSC cost categories, Depot Installation Support and General Depot Support, and replacement with costs obtainable from the WSCRS system. Depot Installation Support costs should be replaced by the funded and unfunded General and Administrative cost elements from WSCRS. General Depot Support costs should be replaced by funded and unfunded maintenance support cost elements which may be obtained from WSCRS. The WSCRS costs should replace the costs currently developed by WSSC for these two categories

for two reasons: (1) the costs from WSCRS would include the DMIF

funded portion which WSSC does not obtain, and (2) the costs from

WSCRS are already allocated to the MDS level, which would simplify

WSSC processing.

Desmatics further recommends that WSSC obtain the costs for

several additional material categories from the WSCRS system. These

additions would allow for a more complete costing in the Sustaining

Investment category in WSSC. Desmatics provides suggested revised

formats for both the CAIG and USAF Detail reports which incorporate

all of the previously-mentioned changes. These revised formats also

allow for improved cost visibility.

Several topics which are related to the use of cost allocation

ratios based on aircraft flying and possessed hour data are also dis-

cussed in this volume. Desmatics has found that posse sed hour ratios

and combined flying hour/possessed hour ratios tend to underallocate

costs to the aircraft in WSSC due to temporary possession of these

aircraft by Air Force Logistics Command when such planes are receiving

depot-level maintenance. Desmatics suggests the use of assigned air-

craft data available to WSSC to alleviate this underallocation problem.

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I. INTRODUCTION

Desmatics, Inc., under Contract No. F33600-80-C-0554, has conducted a study of the Weapon System Cost Retrieval System (WSCRS), the data system designator (DSD) for which is HO36C. WSCRS is the source of aircraft depot maintenance and consumption spares (formerly known in WSSC as reparable spares) cost information used by the Weapon System Support Cost (WSSC) system, a subsystem of the Air Force Visibility and Management of Operating and Support Cost (VAMOSC) system. This study was initiated by the Office of VAMOSC, the Office of Primary Responsibility (OPR) for the VAMOSC system.

The Statement of Work under which the present study was conducted called for "... research to determine the appropriateness of the HO36C data used in the VAMOSC system ...", and an assessment of "... the impact on VAMOSC outputs of any limitations in the HO36C data." This study focused on the WSCRS output received by WSSC and the use which WSSC makes of that output. No detailed analysis of WSCRS data sources was undertaken.

Desmatics conducted an assessment of WSSC depot-level cost algorithms in 1983 as part of its independent validation and verification of the WSSC system. That study is documented in Technical Report No. 115-7, <u>An Evaluation of the WSSC Cost Allocation Algorithms V: Depot Level Categories</u> [4]. Consideration was given in that report to the depot cost data provided to WSSC by WSCRS, but no in-depth evaluation of WSCRS data was undertaken at that time. The

present study provides a more detailed assessment of WSCRS as a data source for WSSC.

Section II of this report describes the sources of information from which WSCRS obtains data, outlines the algorithms used by WSCRS to allocate costs, and describes the interface between WSCRS and the WSSC system. Section III discusses the criteria used by WSSC to select information from its interface with WSCRS. Section IV considers the appropriateness of the WSCRS data which WSSC uses, while Section V contains discussions of other related topics. Conclusions and recommendations are presented in Section VI, together with comments from the Office of VAMOSC.

II. BACKGROUND

WSCRS is a management information system designed to provide sup-
port for a variety of cost analysis functions. It supplies a number
of Air Force, Department of Defense (DOD) and other agencies with in-
formation on depot maintenance and condemnation costs for major USAF
aircraft and missile weapon systems. The primary documentation for
WSCRS is its users manual, AFLC Manual 173-264 [18]. Supplementary
information is provided in the Cost Information Handbook for Depot
Maintenance [6]. The WSSC system is documented in its users manual,
AFR 400-31, Volume II [17], and in the WSSC System Specification [10].

WSCRS collects and allocates historic depot maintenance costs,
and base-level and depot-level condemnation costs for major USAF air-
craft and missile weapon systems and their exchangeable subassemblies.
Costs are also provided for airborne auxiliary power units (APU) and
ground power units (GPU). Aircraft and missiles are identified by
Mission Design Series (MDS). Aircraft engines, APUs, and GPUs are
identified by Type Model Series (TMS).

Cost data is retained by WSCRS indefinitely in two main files:
the WSCRS Detail Data Base, and the WSCRS Summary Data Base. Individual
cost elements are tracked and reported by weapon system for each fiscal
year. Repair costs are identified to end items, to the Air Logistics
Centers (ALC) responsible for the repair, to work breakdown structure
(WBS) elements, and to work performance category (WPC) codes. The WBS
indicates the portion of the weapon system on which the work was per-

formed, while the WPC indicates the type of maintenance involved.

Costs are tracked by WSCRS for twenty-five cost elements. In addition, direct labor hours are also provided for military and civilian depot maintenance personnel.

The following three subsections provide an overview of WSCRS and its WSSC interface. Section A presents a summary of the data systems and other sources supplying data to WSCRS. Section B provides a discussion of the algorithms used by WSCRS for cost allocation. Section C gives a brief description of the WSCRS interface to the WSSC system.

A. WSCRS INTERFACE SYSTEMS

In order to develop the depot maintenance costs for major USAF aircraft and missiles, the WSCRS system maintains several manual and automated data interfaces. The following are sources of data for the WSCRS system:

1. Recoverable Consumption Item Requirements System, D041

2. Past Program Data System, G033J

3. DMS,AFIF Cost Accounting Production Report, H036B

4. Interchangeability/Substitution (I&S) Data Maintenance System, D097

5. Various H036C master files and manual inputs

The WSCRS system, like the WSSC system, was developed under the constraint that it use data collected from existing Air Force data systems. In most cases, data from the systems listed above is not at

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the MDS level. Therefore the WSCRS system employs numerous allocation methodologies to attribute these costs to MDSs. These algorithms are described in AFLCM 173-264 [18] and are outlined later in Section II.

Along with the accuracy of any internal WSCRS processing, the accuracy of WSCRS output data is highly dependent on the accuracy of its input data systems. It is beyond the scope of Desmatics' contract to validate and verify these input systems. However, each data source is discussed briefly below.

The H036B system is the source of depot maintenance cost data for the fiscal year. This data is at the National Stock Number (NSN) or Federal Supply Class (FSC) level. Several aspects of the data obtained by WSCRS from this system are discussed later in this volume. Desmatics has also discussed the H036B system previously in Technical Report No. 118-3 [19].

The D041 system furnishes several items of data to WSCRS, in the form of various record formats. First, a file is provided which contains the identification of a subcomponent to its next higher assembly (NHA) applications. This file (known as Format 50 records) contains the item's National Stock Number (NSN), the quantity per application (QPA), and the percentage of each application using that stock number. This information is used to develop the relationships of components within and among MDSs. These relationships are necessary to allocate both depot maintenance and condemnation costs in the WSCRS system.

The D041 system also provides to WSCRS the component nomencla-

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ture, unit price, and the number of base-level and depot-level condemnations for each component (on Format 01-11 records). This price and condemnation data is used by WSCRS to develop condemnation replacement costs. The validity of these prices is discussed in the following subsection.

The GO33J system supplies information on the flying hours and possessed hours for MDSs for the prior thirty months. This system also passes to WSCRS an engine application table which allows WSCRS to relate aircraft engines and auxiliary power units (APUs) to MDSs. The table also tells the percentage of time the units operate in relation to the weapon system's operating time, since many of these units are only needed for assistance on take-off, for example.

The DO97 system maintains the cross-reference between interchangeable and substitutable (I&S) stock numbers and the related master stock number. This information is used by WSCRS to ensure that I&S items repaired at the depot are costed to an MDS.

Finally, several files are input to WSCRS by the system Office of Primary Responsibility (OPR). Information such as interim contractor support costs and contractor logistics support costs are input to WSCRS each year. A complete listing of these inputs is given in Chapter 2 of the WSCRS manual [18].

B. WSCRS COST ALLOCATION ALGORITHMS

As is the case in the WSSC system, most of the costs which are

of concern to the WSCRS system are not directly identifiable to an MDS from available input data, or are for components used on several MDSs (known as common components). For these reasons it is necessary for WSCRS to allocate many of the costs to MDSs from lower-level costs or common costs.

The WSCRS system uses two basic methods to allocate depot maintenance and condemnation costs: usage (flying/operating hour) ratios and inventory ratios. The following section gives a brief description of the cost allocation process in the WSCRS system.

The primary sources of information used to relate a lower-level cost to a weapon system are the D041 Format 50 file and the G033J Engine Application file. The Format 50 records provide the data necessary to relate lower-level components (by NSN) to the MDS or engine TMS level. The WSCRS system builds the relationships to three levels (known as levels of indenture) below both the MDS level and the TMS level. The G033J file relates aircraft engine TMSs and aircraft auxiliary power unit TMSs to an MDS (or MDSs).

In certain cases, however, WSCRS cannot relate depot maintenance costs to a particular MDS. This is because the H036B cost records can have the costs reported only to the Federal Supply Class (FSC) level or to a part number, rather than to an NSN. The FSC is the first four digits of the NSN and represents a group of similar items. Costs reported to part numbers in the H036B cost data (which do not appear in the D041 or D097 systems) are accumulated by WSCRS to the FSC level. This situation would occur, for example, for locally

manufactured items and manufacturer part numbers. Costs at the FSC

level are allocated in WSCRS to all MDSs having an application with

that FSC, as identified by the DO41 Format 50 application records.

Further description of the WSCRS processing of H036B data is

presented in Section IV. The cost allocation algorithms used in

WSCRS are outlined in the following paragraphs.

1. Depot Maintenance Cost Allocation

The ratio which is used to allocate a particular cost depends on

the level at which the cost is reported in the H036B system. The

WSCRS system categorizes each H036B cost record to one of three levels:

NSN, FSC, or on-equipment overhaul. Most costs in H036B are reported

at the NSN level, which indicates repair of a part below the MDS or

TMS level.

For costs reported at the NSN level, WSCRS develops one of two

types of allocation ratios, depending on how the spares requirement

for the component is computed in DO41. The allocation ratio for a

component which has a spares requirement computed based on inventory

(first digit of program select code on DO41 Format 50 record equal to

3) [11] is of the form:

$$\frac{\text{Total inventory months, all applications this NSN, this MDS}}{\text{Total inventory months, all applications this NSN, all MDSs}}$$

This factor is known in WSCRS as the NSN inventory factor. As mentioned

earlier, WSCRS maintains applications information for NSNs to three levels below both the MDS level and the TMS level.

All other H036B NSN-level costs (i.e., for those components whose spares requirements are not based on inventory) are allocated to an MDS with ratios of the form:

$$\frac{\text{Total operating hours, all applications this NSN, this MDS}}{\text{Total operating hours, all applications this NSN, all MDSs}}$$

The operating hours for an MDS are the reported flying hours from the G033J system. For those items with TMS (engine or APU) applications, the operating hours are developed from information in the G033J Engine Application file, which reports on operating hours for a TMS in relation to weapon system operating hours. This allocation factor is known in WSCRS as the NSN Flying Hour (FH) factor.

Those depot costs identified to only the FSC level and identified by Weapon System Code (WSC) [18] as aircraft related are allocated with ratios which are of the form:

$$\frac{\text{Flying hours, this MDS, this FSC application}}{\text{Total flying hours, all MDSs with this FSC}}$$

The flying hours for all MDSs which are associated with an FSC are determined by identifying the weapons systems encompassed by the FSC using D041 Format 50 application records. This factor is called the FSC FH factor.

On-equipment aircraft overhaul cost records from H036B are identified as those records which contain TMS or aircraft MDS identification,

rather than an NSN. These costs are allocated with operating hour ratios also:

$$\frac{\text{Total Operating hours, overhauled item, this MDS}}{\text{Total Operating hours, overhauled item, all MDSs}}$$

This factor is known as the Overhaul FH factor in WSCRS.

In Desmatics' opinion, these methods used by WSCRS for the allocation of depot maintenance costs are intuitively reasonable and valid. The next subsection discusses condemnation cost development in the WSCRS system.

2. Condemnation Cost Development

The cost of condemnation of reparable components is determined in WSCRS from data obtained from DO41. The condemnation cost for a particular component in a particular MDS is determined by:

$$\frac{(\text{Base+Depot Condemns}) \times (\text{unit price}) \times (\text{NSN FH factor})}{\text{MDS FH}}$$

The NSN FH factor is as described above. The unit price and condemnation figures for a component are from DO41. The unit price, according to AFLCR 57-4 [11], generally represents the price at last procurement, updated for inflation.

There is a strong possibility that the unit price is not representative of the actual replacement cost of that item. This is because the price may not reflect such factors as previous quantity discounts

vs. present low-quantity purchases or high retooling expenses for the remanufacture of discontinued parts. It is also possible that because of technological advances, an item may cost less today than at last procurement.

Because of such factors, it is difficult to portray accurately the cost of reparable spare replacement, particularly for older weapon systems which are no longer being deployed. At present, however, D041 is the only source of the price data for the Air Force. Desmatics recommends that the Office of VAMOSC continue to use this condemnation cost data from WSCRS, but also add a notation in the WSSC User's Manual [17] which describes the constraints of this source of data.

C. WSCRS INTERFACE TO WSSC

Under a Memorandum of Agreement, WSCRS annually supplies an interface file to the WSSC system. In FY81 WSCRS provided a specially tailored file to WSSC. However, since FY82 the file provided has been a copy of the WBS Summary File, which is one of the WSCRS standard products.

The WSCRS WBS Summary File received annually by WSSC contains the fiscal year, the weapon system MDS, record identification codes, 25 cost fields, and four labor hour fields, as shown in Table 1. Position 2 of the Record Identification field contains a numeric record code (1-9), which corresponds to the WBS summary code for aircraft or missiles.

Position 3 of the Record Identification field contains a summary

Field No.	Data Element Name
1	Fiscal Year
2	Standard MDS
3	Record ID Pos 2 = 1 - 9 Pos 3 = blank, C, H, X, or Y Pos 4 = E or O
4	Direct Civilian Labor Cost
5	Direct Civilian Labor Hours
6	Other Direct Civilian Labor Cost
7	Other Direct Civilian Labor Hours
8	Direct Military Labor Cost
9	Direct Military Labor Hours
10	Other Direct Military Labor Cost
11	Other Direct Military Labor Hours
12	Funded Direct Material Cost
13	Unfunded Direct Material Cost - Investment Items
14	Unfunded Direct Material Cost - Exchangeables
15	Unfunded Direct Material Cost - Mod Kits
16	Unfunded Direct Material Cost - Expense
17	Funded Other Direct Cost
18	Unfunded Other Direct Cost
19	Funded Operations Overhead
20	Unfunded Operations Overhead
21	Funded General and Administrative Cost
22	Unfunded General and Administrative Cost
23	Contract/Interservice Cost
24	Government-Furnished Material - Investment
25	Government-Furnished Material - Exchangeables
26	Government-Furnished Material - Mod Kits
27	Government-Furnished Material - Expense
28	Funded Government-Furnished Services
29	Unfunded Government-Furnished Services
30	Funded Organic Maintenance Support Cost
31	Unfunded Organic Maintenance Support Cost
32	Condemnation Cost

Table 1. Data Elements of the WSCRS Work Breakdown Structure Summary File

code which indicates the type of maintenance done. WBS summary records are classified into five categories within WBS group. Position 3 of the record code identifies these categories as:

C	Conversion (class V modification)
H	Modification
X	Contractor logistics support
Y	Interim contractor support
blank	Baseline maintenance costs

Baseline maintenance costs are defined in the WSCRS system as those costs which are for maintenance work not falling into any of the four categories C, H, X, or Y. It should be noted that maintenance support costs are not included by WSCRS. This topic is discussed in detail in Section III of this report.

Costs representing exchangeable items or on-equipment work are summarized in separate records identified by an E or an O in position 4 of the Record Identification field. More detailed descriptions of the cost fields in WSCRS WBS Summary records, as well as the record identification codes, are given in later sections of this report.

WSSC uses data from the WSCRS WBS Summary File as the source of cost information for Depot Maintenance and for the Consumption Spares portion of Sustaining Investment. The next sections of this report discuss how WSSC selects and processes WSCRS data from the WBS Summary File.

III. WSSC SELECTION CRITERIA AND DISPLAY OF WSCRS COSTS

WSSC does not use all of the cost information provided to it by WSCRS. This section describes the WSSC cost selection process for the cost categories of Depot Maintenance and Sustaining Investment. A discussion of the depot-level categories of Installation Support and General Depot Support is also included. WSSC currently obtains costs for these categories from the Accounting and Budget Distribution System, DSD HO69R, but a discussion is relevant as these costs are also available from WSCRS.

A. DEPOT MAINTENANCE COSTS

The WSSC selection process for the depot maintenance cost category is outlined in this section. The WSSC system provides output reports in two formats, the USAF Detail format and the DOD Cost Analysis Improvement Group (CAIG) format. These reports are described, and suggested improvements to them and the depot maintenance cost selection process are given.

1. WSSC Selection Process and Report Formats

Since the WSCRS data received by WSSC contains costs for missiles as well as all types of aircraft, a table is used to select the MDSs of aircraft costed by the WSSC system. WSCRS records for these MDSs

contain aircraft Work Breakdown Structure (WBS) Group codes which in-
dicate the level of weapon system structure repaired. WBS Group codes
are identified in the data received by WSSC by record codes of 1
through 9. Table 2 lists all the WSCRS aircraft WBS Group codes along
with their record code numbers. Any records with a record code suffix
of C (Conversion) are bypassed by the WSSC system. This code applies
to Class V Modifications which CAIG guidelines [3] do not consider
operating and support costs since these modifications result in opera-
tional capabilities other than those originally specified for the end
item.

In the current version of the WSSC user's manual, AFR 400-31,
Volume II [17], only six WBS codes are given. These are being changed
by a VAMOSC Information System Requirements Document (ISRD VAM-D85-024)
to conform with the WSCRS WBS Group codes, but they are listed below
for reference purposes:

WSSC WBS	WSCRS WBS
Ax1	AF
Ax2	EO, EA
Ax3	AA
Ax4	VI, VC, VN
Ax5	AR
Ax6	SU

Each WSCRS record also contains a number of cost categories
referred to as cost elements. Not all of the cost elements contained
in the WSCRS records are used by WSSC. With the exception of direct
military labor expenses, only cost elements which are funded by the
Depot Maintenance Industrial Fund (DMIF) are selected for inclusion

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in the WSSC depot maintenance cost category. These are listed in Table 2. Other costs which are not paid for by the DMIF, referred to as unfunded costs, are excluded. The funded cost element of General and Administrative Expense is also excluded.

The cost records selected from WSCRS contain data for all commands, but the WSSC system costs only MDSs for seven commands (SAC, TAC, MAC, ATC, USAFE, AAC, and PACAF). These are referred to as relevant commands. In order to allocate the relevant command portion of WSCRS costs, cost records for each MDS are multiplied by a Relevant/ All ratio based on flying hours and possessed hours for each MDS. The Relevant/All ratio and the selection of MDSs are discussed further in Section V.

Depot Maintenance costs in the WSSC system are displayed in two output formats. The USAF Detail format currently shows depot maintenance costs by groupings of the following WSCRS Work Breakdown Structure Group codes:

Group	WBS
PDM Modifications	AF
Engines	EO, EA
Avionics	VI, VC, VN
Other Maintenance	AA, AR, SU

However, an ISRD, VAM-D85-024, has been approved to change this format in the WSSC system to display each WBS Group Code separately. Table 3 lists the proposed categories and the costs included in each for the USAF Detail format. The CAIG format, which is more general and corresponds to CAIG guidelines for displaying O&S costs [3], is

WSCRS WBS Group Codes	Description	WSCRS Record Code
AF	Aircraft Overhaul	1
EO	Engine Overhaul	2
EA	Engine Accessories	3
AA	Aircraft Accessories	4
VI	Avionics, Instrumentation	5
VC	Avionics, Communication	6
VN	Avionics, Navigation	7
AR	Armament	8
SU	Support Equipment	9

Within WBS Group Code the following cost elements are selected:

Direct Civilian Labor Cost
Other Direct Civilian Labor Cost
Direct Military Labor Cost
Other Direct Military Labor Cost
Funded Direct Material Cost
Funded Other Direct Cost
Funded Operations Overhead Cost
Contract/Interservice
Government-Furnished Material - Expense Items
Funded Government-Furnished Services
Funded Organic Maintenance Support Cost

Table 2: WSCRS Data Elements Included by WSSC

Output Category	WBS Group Code
Aircraft Overhaul	AF
Engine Overhaul	EO
Engine Accessories	EA
Aircraft Accessories	AA
Avionics, Instrumentation	VI
Avionics, Communication	VC
Avionics, Navigation	VN
Armament	AR
Support Equipment	SU
Class IV Modification Installation	None (G079 data)
Interim Contractor Support (ICS)	All with record code suffix of Y
Contractor Logistics Support (CLS)	All with record code suffix of X

Within the WBS category the following costs are displayed:

Output Category	WSCRS Cost Element
Material	Funded Direct Material
Contract/Interservice	Contract/Interservice
	Government-Furnished Material - Expense
	Funded Government-Furnished Services
Other	Funded Other Direct Cost
	Funded Operations Overhead
	Funded Organic Maintenance Support
Airmen Pay	Direct Military Labor Cost
	Other Direct Military Labor Cost
Civilian Pay	Direct Civilian Labor Cost
	Other Direct Civilian Labor Cost

Table 3: WSSC USAF Detail Report Format - Depot Maintenance
(Incorporating ISRD VAM-D85-024 changes)

shown in Table 4. This table reflects the CAIG format upon implementation of ISRD VAM-D85-024.

On the current CAIG report format, WBSs of VI, VC, VN, and AR are listed under the category of "Other Repair." ISRD VAM-D85-024 eliminates this category and places those WBS Group Codes under "Component Repair," which more accurately describes the work done. ISRD VAM-D85-024 also provides separate visibility in the Depot Maintenance category for the line items of contractor logistics support (CLS), interim contractor support (ICS), and modification installation costs on both report formats.

Contractor Logistics Support (CLS) and Interim Contractor Support (ICS) are two cost elements which CAIG guidelines suggest should be given separate visibility. Contractor Logistics Support is a method of providing all or portions of organizational, intermediate, or depot support for a weapon system, subsystem, or item of equipment. CLS is normally used when the establishment of AFLC organic logistics support is not cost effective. Interim Contractor Support is temporary maintenance performed by a contractor while an organic maintenance capability is being phased in [18].

CLS and ICS can be identified in WSCRS by a record code suffix of X (CLS) or Y (ICS). At this time they are not separated from other depot costs, but ISRD VAM-D85-024 will provide this visibility on the WSSC reports as shown in Tables 3 and 4.

CAIG guidelines also indicate that modification labor costs should be displayed separately under the depot maintenance cost

Output Category	WBS Group Code
Airframe Rework	AF
Engine Rework	EO, EA
Component Repair	AA, VI, VC, VN, AR
Support Equipment Repair	SU
Class IV Modification Installation	None (G079 data)
Interim Contractor Support (ICS)	All with record code suffix of Y
Contractor Logistics Support (CLS)	All with record code suffix of X

Within each WBS the following cost elements are shown:

Output Category	WSCRS Cost Element
Depot Labor	Direct Civilian Labor Cost
	Other Direct Civilian Labor Cost
	Direct Military Labor Cost
	Other Direct Military Labor Cost
	Funded Other Direct Cost
	Funded Operations Overhead Cost
	Funded Organic Maintenance Support
Depot Material	Funded Direct Material
Contract Labor	Contract/Interservice Cost
	Funded Government-Furnished Services
Contract Material	Government-Furnished Material - Expense

Table 4: WSSC CAIG Report Format - Depot Maintenance
(Incorporating ISRD VAM-D85-024 changes)

category. Material costs for modification kits are not depot main-
tenance, but should be included in the category of Sustaining Invest-
ment under Modification Kits [3]. Currently modification labor costs
are embedded in other depot maintenance costs from WSCRS, but there
is a VAMOSC ISRD (VAM-D83-007) to provide separate visibility for
these costs by obtaining them from the Systems and Equipment Modifica-
tion/Maintenance Program System, DSD G079.

Two interface files containing modification installation costs
and modification kit material costs by MDS will be received from the
G079 system. The costs for organic and contract modification labor
from this system will then be subtracted from the WSCRS labor and con-
tract costs for depot maintenance, since these costs are also included
in WSCRS depot maintenance data.

2. Evaluation

There are a number of ways in which the current use of WSCRS data
for costing depot maintenance can be improved. For example, not all
relevant WSCRS depot maintenance cost elements are currently included
by WSSC, and separate visibility can be provided for other costs in
order to provide more useful information to WSSC users. Specifically,
there are five areas of improvement addressed here: 1) missing cost
elements, 2) modification labor costs, 3) CLS costs, 4) funded organic
maintenance support costs, and 5) visibility of labor costs on the
CAIG report format.

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Desmatics believes that by ignoring the unfunded cost elements
in WSCRS the total cost of providing depot maintenance to aircraft
is not being portrayed by the WSSC system. Unfunded costs, although
not paid for by the Depot Maintenance Industrial Fund, come out of
Air Force appropriations. Not all relevant funded cost elements are
included by WSSC either. In Desmatics' opinion the following cost
elements should be added to the WSSC Depot Maintenance cost category:

    Unfunded Other Direct Cost
    Unfunded Operations Overhead
    Unfunded Government-Furnished Services
    Unfunded General and Administrative Expense
    Funded General and Administrative Expense

Unfunded Other Direct Cost is used mainly for temporary duty (TDY)
travel expenses of engineers or other non-DMIF personnel travelling on
behalf of a specific MDS. The cost element of Unfunded Operations Over-
head is used primarily for military personnel costs for indirect effort,
for example, shop supervision [8]. Unfunded Government-Furnished
Services includes the cost of TDY, per diem, military personnel,
engineers and other non-DMIF personnel providing support to government
contractors.

Since the funded counterparts of these costs are currently in-
cluded by the WSSC system, the unfunded elements should be costed as
well. The objective of WSSC is not to capture the cost of operating
the Depot Maintenance Industrial Fund, but rather to cost aircraft
depot maintenance in the Air Force as a whole. Because these costs
are not embedded in any of the other WSSC cost categories, the cost
of aircraft ownership is being understated.

Although Funded Direct Material is costed by the WSSC system, Desmatics does not recommend adding Unfunded Direct Material - Expense to the depot maintenance category. This cost element is used mainly for customer furnished material, which is already included in unit-level costs provided to WSSC by the HO69R system. For example, base maintenance material is sometimes sent along to the depot with a reparable item because the depot is out of stock.

The Office of VAMOSC has excluded Funded General and Administrative Expense from the WSSC system because it seems to agree with the CAIG definition of fixed costs. Desmatics disagrees with this contention, however. Funded General and Administrative Expense is an overhead expense and includes such costs as computer programming, long distance telephone service, printing, and security. While a portion of these costs may be fixed, they do not appear to be fixed costs in the conventional sense of the term. Additionally, these overhead costs are included in charges levied by contractors and other services for repair of Air Force equipment. Since the unfunded and contract/interservice portions of these costs are included by WSSC, Desmatics recommends that Funded General and Administrative Expense be added to the depot maintenance cost category of WSSC to insure complete costing.

Unfunded General and Administrative expenses are currently included in the WSSC system under the category of Depot Installation Support. These costs are obtained from the HO69R accounting system. Desmatics recommends that these costs be obtained from WSCRS instead. WSCRS costs are identified to the MDS level whereas the HO69R costs

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must be allocated to this level by WSSC. So that the cost of Depot

Maintenance is not understated, Desmatics recommends that Unfunded

General and Administrative Expense not be displayed as Depot Instal-

lation Support, but be included with other overhead costs in the

Depot Maintenance category. This topic is discussed in more detail

in Section III.C.

Although there is an ISRD (VAM-D83-007) in place to obtain modi-

fication labor costs from the G079 system, they can be more easily

obtained directly from WSCRS. These costs are currently included with

other types of depot maintenance, but Desmatics recommends that cost

elements with a record code suffix of H (Modification) be separately

displayed.

According to HQ AFLC personnel, contract depot maintenance modi-

fication and maintenance costs are recorded separately in HO36B. For

organic depot maintenance activities, however, modification and main-

tenance costs are combined and recorded under the predominant Work

Performance Category (WPC) code if both are performed at the same time.

According to personnel at HQ AFLC, there are plans to separate these

costs based on standard labor hours at the time the work is completed.

This would mean that the costs in WSCRS recorded under a WPC of H

(Modification) would only include costs for other than Class V Modi-

fications. Costs for aircraft maintenance would not be found in this

category, and modification labor costs would not be included under

maintenance WPCs.

Currently, the distinction between WSCRS modification labor costs

and maintenance labor costs is not clear cut. However, in Desmatics'
opinion using WSCRS costs is still preferable to the proposed GO79
interface.

Using WSCRS data for modification costs would eliminate the neces-
sity of adding another interface, GO79, to the WSSC system. (See
Section III.B on using WSCRS for modification kit material costs.)
The GO79 costs would then not have to be subtracted from the WSCRS
costs for depot maintenance. There is always a possibility of overlap
when combining costs from different systems in this manner. Since
the GO79 system contains information on investment costs, not expen-
ditures, the visibility of depot maintenance costs currently provided
by the WSCRS system is likely to be obscured if ISRD VAM-D83-007 is
implemented. For these reasons, Desmatics recommends that WSCRS cost
elements be used for the Modification Installation line item.

Contractor Logistics Support and Interim Contractor Support costs
recorded in WSCRS are obtained by MD from HQ AFLC/MMM and are allo-
cated to MDSs. These costs include only CLS and ICS obligations
which are funded by AFLC. All ICS costs are funded by AFLC, but CLS
may be funded by the operational commands as well [15]. CLS costs
of this nature are not currently included by WSCRS. These costs are
available in the HO69R system, however, and Desmatics is investigating
the possibility of using this system to identify to specific aircraft
the CLS costs of the operational commands. The results of this in-
vestigation will be included in Desmatics' forthcoming technical report
on the HO69R system and its impact on the VA. C systems. In the

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meantime, the WSSC documentation should indicate that Contractor Logistic Support costs which are funded by the operational commands are not included in the WSSC depot maintenance category.

Funded Organic Maintenance Support costs are currently selected by WSSC for inclusion in the depot maintenance cost category. In Desmatics' opinion this element should be removed from the depot maintenance selection criteria for two reasons. First, Department of Defense guidelines indicate that maintenance support costs should not be considered a part of depot maintenance. Instead, they should be costed as depot non-maintenance [8]. The WSSC system currently includes unfunded maintenance support costs (obtained from the HO69R system) in the depot non-maintenance category of General Depot Support. If funded maintenance support costs are to be included in WSSC, they should be displayed as depot non-maintenance as well.

Secondly, maintenance support costs, although currently reported to WSCRS, are not included in WSCRS output products because they are depot non-maintenance costs. The fields for these cost elements do, however, appear on WSCRS outputs, but they are filled with zeroes. Since there is no separate visibility for Funded Maintenance Support on the WSSC output products, users may believe that these costs are included in Depot Maintenance, when actually they are not. For these reasons, Funded Maintenance Support should be removed from the depot maintenance selection criteria. Maintenance support costs are discussed further in Section III.C.

A number of WSCRS cost elements that are not direct labor are

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displayed under the Labor line item on the CAIG report format (see Table 4). Desmatics recommends that separate visibility be given to the direct labor cost elements, and that all other costs, e.g., overhead, be displayed under another subheading entitled "Other." This should make the CAIG report format more meaningful to WSSC users.

A number of changes to the selection process and WSSC output products have been suggested in this section. Tables 5 and 6 show the proposed WSSC output products for the USAF Detail and the CAIG reports, along with the WSCRS cost elements and record code suffixes necessary to incorporate the changes recommended in this section.

B. SUSTAINING INVESTMENT

Sustaining investment includes the cost categories of Consumption Spares and Modification Kits. (It should be noted that throughout WSSC documentation the terms Replacement Spares, Reparable Spares, Consumption Spares, and Replenishment Spares are used interchangeably. Desmatics will also employ this convention throughout this volume.) These terms refer to the cost of materials to replace spare parts or modify end items because of wear-out or safety defects. These costs do not include initial spares, which are considered an acquisition cost not an operating and support cost. The following sections describe the WSSC use of WSCRS costs for the Consumption Spares category, and the suggested use of WSCRS costs for the Modification Kit cost category.

Output Category	WBS Group Code	Record Code Suffix
Aircraft Overhaul	AF	All except C, X, Y, and H
Engine Overhaul	EO	Same as WBS code AF
Engine Accessories	EA	Same as WBS code AF
Aircraft Accessories	AA	Same as WBS code AF
Avionics, Instrumentation	VI	Same as WBS code AF
Avionics, Communication	VC	Same as WBS code AF
Avionics, Navigation	VN	Same as WBS code AF
Armament	AR	Same as WBS code AF
Support Equipment	SU	Same as WBS code AF
Class IV Modification Installation	All	H
Interim Contractor Support (1)	All	Y
Contractor Logistics Support (1)	All	X

Within the WBS category the following costs are displayed:

Output Category	WSCRS Cost Element
Material	Funded Direct Material
Contract/Interservice	Contract/Interservice (1) Government-Furnished Material - Expense Funded Government-Furnished Services Unfunded Government-Furnished Services
Other	Funded Other Direct Cost Unfunded Other Direct Cost Funded Operations Overhead Unfunded Operations Overhead Funded General and Administrative Expense Unfunded General and Administrative Expense
Airmen Pay	Direct Military Labor Cost Other Direct Military Labor Cost
Civilian Pay	Direct Civilian Labor Cost Other Direct Civilian Labor Cost

(1) All costs for CLS and ICS are recorded under Contract/Interservice

Table 5: Proposed WSSC USAF Detail Report Format - Depot Maintenance

Output Category	WBS Group Code	Record Code Suffix
Airframe Rework	AF	All except C, X, Y, and H
Engine Rework	EO, EA	Same as WBS code AF
Component Repair	AA, VI, VC, VN, VR	Same as WBS code AF
Support Equipment Repair	SU	Same as WBS code AF
Class IV Modification Installation	All	H
Interim Contractor Support (1)	All	Y
Contractor Logistics Support (1)	All	X

Within each WBS the following cost elements are shown:

Output Category	WSCRS Cost Element
Depot Labor	Direct Civilian Labor Cost
	Other Direct Civilian Labor Cost
	Direct Military Labor Cost
	Other Direct Military Labor Cost
Depot Material	Funded Direct Material
Other Depot	Funded Other Direct Cost
	Unfunded Other Direct Cost
	Funded Operations Overhead
	Unfunded Operations Overhead
	Funded General and Administrative Expense
	Unfunded General and Administrative Expense
Contract Labor	Contract/Interservice Cost (1)
Contract Material	Government-Furnished Material - Expense
Other Contract	Funded Government-Furnished Services
	Unfunded Government-Furnished Services

(1) All costs for CLS and ICS are recorded under Contract/Interservice

Table 6: Proposed WSSC CAIG Report Format - Depot Maintenance

1. Consumption Spares

Consumption spares includes the cost of replenishing the inventory of aircraft assemblies, spares, and repair parts that are normally repaired and returned to stock. In addition, this cost may include procurement of stock levels that are not provided by initial spares procurement. Condemnation costs from the WSCRS system are used for the Consumption Spares cost category in WSSC. The assumption is that a consumption spare is used whenever an item has been condemned either at the base or the depot.

The condemnation cost is calculated in WSCRS as the condemnation rate times the unit price. The condemnation rate and the use of unit prices from the D041 system were discussed in Section II. It was pointed out in that section that the D041 unit prices may not reflect the current replacement price, and therefore the current consumption spares cost. Because D041 is currently the only source of this price information, Desmatics recommends the Office of VAMOSC continue using these costs for reparable spares, but that a notation be added to the WSSC manual describing the constraints of the current algorithm.

Currently, a consumption spares cost is calculated only when there has been a condemnation. However, there are instances when a new part is issued, but there is no accompanying turn-in or condemnation [8]. Costs are also not calculated for procurement of additional stock levels. The WSSC documentation should reflect those limitations of the Consumption Spares algorithm.

2. Modification Kits

The category of Modification Kits includes the cost of modification kits and modification initial spares for aircraft. The modifications included are those needed to achieve acceptable safety levels, overcome mission capability deficiences, improve reliability, or reduce maintenance costs. Excluded are Class V modifications which are undertaken to provide improved operational reliability not called for in the original design or performance specifications [17].

Modification costs are currently obtained from HO69R investment costs. These costs are identified in the AFLC HO69R system by Budget Program Activity Codes (BPACs) of 11xxxx (aircraft modifications), but there is an ISRD (VAM-D83-007) in progress to replace this interface and to obtain these costs from the GO79 system instead. WSSC currently has no interface with the GO79 system, and an easier way to obtain these costs would be to select the following cost elements from the WSCRS system:

Unfunded Direct Material - Modification Kits
Government-Furnished Material - Modification

These cost elements appear in the WSCRS interface with several record suffix codes (see Section II), not just H (Modification). This is because modifications are often accomplished along with other repairs [12]. Modification material costs will be coded other than H if the modification represents a subordinate portion of the man-hours expended on an item. For this reason, Desmatics recommends that costs in WSCRS with the elements of Unfunded Direct Modification Material and Government-

Furnished Modification Material be reported in the Modification Kits

cost category if they occur under codes other than C (Conversion).

(A suffix code of C in the WSCRS interface to WSSC identifies such

conversion records.) Table 7 shows where modification kit costs from

WSCRS would be displayed on the WSSC output products.

C. OTHER DEPOT LEVEL COSTS

WSCRS was developed to provide one consistent source of historic

depot cost information for use by cost analysts [18]. In order to

maintain this consistency, WSSC should use depot-level cost information

from the WSCRS system wherever feasible. This would also allow more

efficient processing in the WSSC system since costs in WSCRS are already

allocated to the MDS level. This section discusses a recommended

change in processing for two of WSSC's depot-level categories: Depot

Installation Support and General Depot Support.

1. Depot Installation Support

The category of Depot Installation Support currently includes

the depot share of costs in Program Element Codes (PECs) xxx94, xxx95,

and xxx96 from the HO69R system. These PECs are used to record the

costs of Real Property Maintenance, Communications, and Base Operating

Support respectively [13]. They include the same types of costs as

the Funded and Unfunded General and Administrative Expenses recorded

Cost Category	WSCRS Cost Elements
SUSTAINING INVESTMENT	
Consumption Spares	Condemnation Cost
Modification Kits	Unfunded Direct Material - Modification Government-Furnished Material - Modification

Table 7: Recommended Cost Elements for Sustaining Investment

in WSCRS. There are no DMIF funded expenses in HO69R, however.
Because WSCRS is a more complete source of this data, Desmatics
recommends that WSCRS cost elements be used in place of HO69R data.
This change would also make WSSC processing more efficient as General
and Administrative expenses in WSCRS are already identified to the
MDS level, whereas the HO69R data is not readily identifiable to
aircraft or individual MDSs and must be allocated by WSSC.

Because Funded and Unfunded General & Administrative Expenses
are depot maintenance overhead expenses, Desmatics recommends reporting
them in the Depot Maintenance category, and eliminating the Depot In-
stallation Support category. It is more appropriate to display these
costs in the depot maintenance category along with other types of
overhead costs, e.g., operations overhead. These costs are included
in contract/interservice depot maintenance costs, therefore, they
should be costed as depot maintenance for organic activities as well.

2. General Depot Support

General Depot Support includes the cost of personnel and material
supporting the depot-level functions of supply, inventory control
points, procurement, logistics support, and maintenance support. These
costs are obtained by WSSC from the HO69R accounting system. They are
identified by PECs of 71111, 71112, and 71113 [17].

These costs are also reported by the HO36B feeder system to WSCRS
in the cost element of Unfunded Maintenance Support. WSCRS currently

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receives all cost elements from H036B, but does not retain costs for the elements of Funded and Unfunded Maintenance Support. These elements appear on the WSCRS outputs, but the dollar amounts are always zero. As previously mentioned, this is because maintenance support costs are considered depot non-maintenance, not depot maintenance.

While WSCRS is tasked with costing only depot maintenance costs, the WSSC system is concerned with total operating and support cost. To maintain consistency within depot-level costs, Desmatics recommends that the cost elements of Funded Maintenance Support and Unfunded Maintenance Support be used for the General Depot Support cost category in place of the current H069R data. These costs are more comprehensive than the H069R data currently used, and also are more readily identifiable to MDSs. (See [2] for a more detailed comparison of maintenance support costs in H036B and H069R.)

In the H036B interface to WSCRS, maintenance support costs are identified by WPC codes of P, Q, R, and S, and the cost elements of Funded and Unfunded Organic Maintenance Support. This data is available at the Federal Supply Class (FSC) level. According to the WSCRS OPR, there is a possibility that WSSC could obtain these costs from the WSCRS system. Even though WSCRS does not utilize these costs in its output products, they could be allocated along with other FSC-level costs and passed along to the WSSC system. FSC costs identified to weapon systems via the H036B Weapon System Code are allocated by the WSCRS FSC FH Factor to an MDS. This allocation was discussed in Section II.

IV. APPROPRIATENESS OF WSCRS DATA TO VAMOSC

This section discusses the appropriateness of WSCRS data to the
WSSC system. By this is meant the degree to which the data currently
provided to the WSSC system by WSCRS is useful for fulfilling the
reporting objectives of WSSC. The first subsection deals with levels
of indenture, the term used in WSCRS and WSSC to describe the succes-
sive layers of reparable components of an MDS or TMS. Components at
the first level of indenture, for example, have the MDS or TMS as
their next higher application. In particular, what is discussed is
the relative completeness of costing for the repair of components
below the MDS and TMS levels in WSCRS. Another subsection addresses
the relationships between actual and standard MDSs vis-a-vis the
reporting of costs by standard MDS in WSCRS.

A. LEVELS OF INDENTURE

A report published by the Rand Corporation in 1981 [7] claims
that WSCRS only provides costs for components one level below the
MDS or TMS level, and that this can result in the loss of up to 95
per cent of component repair costs for an MDS. According to personnel
at HQ AFLC/ACMCI, the Office of Primary Responsibility (OPR) for
WSCRS, however, this information is outdated. WSCRS now processes
repair costs for components down to the third level of indenture for
end items (MDSs or TMSs). The WSCRS OPR estimates that the system

currently provides up to 95 percent of the relevant component repair
costs for any given MDS. Desmatics has examined the processing of
such costs in WSCRS in an attempt to determine whether it does indeed
result in adequate costing of component repairs for WSSC reporting
purposes.

1. Accounting for Organic Depot Maintenance Costs

A job order cost accounting system is used to accumulate organic
depot maintenance costs at DOD depot maintenance activities. Separate
job orders are established for quantities of items or services which
can move through the maintenance process as a continually identifiable
unit; the estimated cost of the maintenance to be performed is one of
the criteria used to delimit the size of individual job orders. All
items on a maintenance-related job order have the same identification
number (MDS, TMS, NSN, or FSC) [8].

Organic depot maintenance costs are reported in the HO36B Cost
Accounting and Production Report. All records have a field entitled
"Item Identification Number"; this identifies the job order to which
the costs on the record apply. When the reported costs are for a
standard series of aircraft, the applicable MDS is recorded here.
For aircraft or rocket engines, or missiles, the applicable TMS desig-
nator is displayed. If the job order involved lower-level components
either an NSN or an FSC (4 characters) followed by a variety of iden-
tifying numbers or characters other than a NIIN (National Item Identi-

fication Number), which would then make it an NSN, would be in this field. Typical entries here are manufacturer's part numbers or base-assigned numbers for locally manufactured items. Each different type of item is specifically identified through the use of special characters at the fifth position of the item identification field (first position after the FSC). For nonmaintenance work, such as maintenance support (WPCs P, Q, R, and S), this field can be left blank.

During the repair cycle on any item or group of items, lower-level components may either be replaced or routed for concurrent repair. The strategy expected to result in earlier completion of the related job order is the one chosen. Those lower-level components replaced in the higher-level item being worked on are usually batched for repair at a later date under separate job orders. However, in order to fully cost the maintenance of a higher-level item, an average cost to repair each component replaced is charged to its job order. This appears on the HO36B cost record of the higher-level item to which the job order applies as an Unfunded Direct Material Cost (Exchanges). This average repair cost is computed and updated annually for every item costed by the HO36B system, and includes work done under WPCs A (Overhaul) or I (Repair), or if such data is unavailable, from engineering estimates. For concurrent repair of lower-level components, the actual costs of the maintenance performed on the components (e.g., labor, material, overhead, etc.) are charged to the job order of the higher-level items from which they were removed [8].

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2. WSCRS Processing of Component Repair Costs

In addition to H036B, WSCRS also interfaces with the D041, D097, and G033J systems. WSCRS also makes use of a number of cross-referencing files and tables useful for identifying and allocating the costs of interest. The D041 system provides subgroup master NSNs together with their next higher applications, D097 provides interchangeable and substitutable components for subgroup master NSNs, and a file from the G033J system relates TMSs to MDSs. In addition, the WSCRS OPR has built (and keeps up-to-date) a list of the component configuration of each MDS and TMS costed, down to the third level of indenture. Prior to processing H036B cost data, WSCRS effectively has a list of all MDS and TMS end item identifiers, and NSN or FSC identifiers for use in selecting all relevant cost records from this data.

In processing H036B data, WSCRS develops two separate files of cost records, one for MDSs and TMSs, and one for components. The component cost file contains all records with an FSC in the first four positions of the item identifier field, and therefore includes all NSN-coded records. This file is subjected to a series of edits using WSCs (Weapon System Codes) and WSB (Work Breakdown Structure) codes to limit it to cost records for common items or those with either an aircraft or missile application. The next series of edits truncates all item identifiers to FSC only, except for those which are full NSNs or temporarily assigned numbers for new noncataloged items. These latter two are left unchanged because they are both candidates for inclu-

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sion in the D041 system. All NSNs are then converted to their subgroup master NSNs. Any of these NSN-coded records which then do not match a record on the NSN-application file (D041 data) or on the MDS or TMS component configuration files are deleted. Similarly, any of the remaining FSC-coded records are deleted if they do not meet the established application criteria.

3. Comments

Because of the manner in which WSCRS processes item and cost input data, repair costs for unique components either three or four levels below the MDS level can be costed. (A third level component of a TMS is equivalent to a fourth level component of its MDS.) Similarly, repairs for components common to more than one MDS can also be costed to this level. The WSCRS OPR is of the opinion that attempts to include costs for components below the third level of indenture would not enhance significantly the level of cost capture at this time.

The D041 and D097 systems both contain only the most current subgroup master NSNs. WSCRS will, therefore, delete any cost records coded with the NSNs of older or obsolete parts; this includes records for both unique and common components. Desmatics has been unable to determine the relative amount of costs that are lost because of this peculiarity of the input data from D041 and D097. As a solution to this problem, the WSCRS OPR is investigating the possibility of establishing an interface with another data system (perhaps one in the

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D143 series) which retains information on older parts. An alternate
solution, which would suffice for WSSC reporting purposes, is to add
these NSN-coded records to the pool of FSC-coded records for alloca-
tion to end items. When viewed from the reporting objectives of
WSCRS, however, this particular solution is suboptimal. The preferred
solution would involve identifying these NSNs directly to their TMS
or MDS applications.

There is no visibility of repair costs for substituted components
by NSN in WSCRS because all their repair costs are reported against
their subgroup master NSNs. This practice does not particularly affect
the WSSC system; it does not require that this level of visibility be
preserved for such costs.

The practice of batching components for later repair at organic
depot maintenance activities can cause distortion of the repair cost
data for end items. If batched components are not repaired in the
same fiscal year as the end items, the repair costs for the end items
can be misstated for that year in the WSSC reports, and probably for
the year in which these costs are finally reported as well. In fact,
this can be a continual source of cost distortion for WSSC. Only
those costs for components repaired concurrently will be accurately
reported consistently for all fiscal years.

It should be noted that this discussion of component repair costs
pertain only to costs reported for AF depots. Contractor and inter-
service costs which are pertinent to WSSC are reported in HO36B as
a single line item. This means that costs for components repaired at

these other facilities will be included, but will probably be confounded with other costs.

In summary, Desmatics is of the opinion that the WSCRS OPR is dealing well with the limitations in the interfacing data systems in attempting to provide full costing for the repair of lower-level components of MDSs and TMSs. In view of the input data limitations, the costing of the repair of lower-level components in WSCRS appears to be adequate for WSSC reporting purposes. Desmatics is also satisfied that the WSCRS OPR is cognizant of all the problems which pertain to this area of costing, and will effect improvements in reporting visibility and accuracy as they become feasible.

B. STANDARD MDSs

Documentation for WSCRS indicates that WSCRS data represents only standard MDSs, i.e., "... the MDS to which one or more actual MDSs are reported ..." [18]. Since actual MDSs are subsumed under standard MDS designators, WSSC cannot provide depot maintenance costs directly for any actual MDS unless it is also a unique standard MDS. For any actual MDS which is not a unique standard MDS, WSSC would have to allocate costs from the standard MDS level among all the actual MDSs of which each is composed.

Earlier standard/actual MDS tables [16] contained numerous instances in which two or more actual MDSs mapped to one standard MDS. However, the WSCRS OPR has indicated that the vast majority of standard MDSs cur-

rently used by WSCRS are unique, and the trend is toward increasingly greater use of unique MDSs.

Desmatics' examination of the MDS Table File (Format C-42 [10]) currently used by WSSC indicated a one-to-one mapping for those MDSs of interest to WSSC. Desmatics therefore concludes that for the MDSs currently costed by WSSC there is no problem caused by the fact that WSCRS uses standard MDSs while WSSC uses actual MDSs. However, if additional MDSs are to be costed by WSSC, they should be checked against the WSCRS standard/actual MDS table, otherwise an allocation method will need to be developed.

V. OTHER TOPICS

This section describes several topics not directly related to the WSCRS system, but which are related to WSSC processing of the WSCRS interface data. The topics which are addressed are flying operations ratios, the relevant/all ratio, and the MDS table. Each of these items is described in a separate subsection.

A. ON THE USE OF FLYING OPERATIONS RATIOS

The WSSC system uses flying operations ratios based on flying hours (FH) and possessed hours (PH) to allocate many of the costs presented in the system. The ratio used most often in the WSSC algorithms may be represented as:

$$.5(FH/\Sigma FH + PH/\Sigma PH). \tag{1}$$

Formula (1) is a particular instance of the more general weighted average:

$$p(FH/\Sigma FH) + (1-p)(PH/\Sigma PH) \tag{2}$$

where the value of p ranges from 0 to 1, inclusive. Specifically, the value of p=0.5 is used in WSSC for many of the algorithms. However, values of 0 or 1 are used in other algorithms. Throughout all applications of this type of ratio, the numerator identifies a unique MDS/CMD/GELOC combination. The denominators vary depending upon the

level of aggregation of the costs being allocated. Table 8 defines

the denominators for each of the cost categories for which the ratio

is currently used. This table also provides the value for p which is

used by the algorithm [5].

As Desmatics discussed in Volume VII [14] of this series, flying

hours and possessed hours are highly correlated. This suggests that,

in fact, one of these two variables will suffice for allocation.

Desmatics recommended that, if flying operations ratios are to be used,

the variable to be chosen is the one which is shown to be more signi-

ficant, for example by a stepwise regression procedure. Regardless of

which of the two variables is chosen for the allocation, another

problem (previously undiscussed) which remains is that the flying

operations ratios, as currently computed, will underallocate costs to

the relevant command aircraft.

This problem arises from the way aircraft possession and flying

data is recorded in the AVISURS (GO33B) interface to WSSC. When an

aircraft from a relevant command is at a depot or contractor repair

facility for repairs it comes into the possession of AFLC, and pos-

sessed hours and flying hours are accumulated to AFLC [1]. In WSSC

cost allocation, a portion of the costs for that aircraft are impli-

citly allocated to AFLC via the previously mentioned ratios. AFLC is

not one of the seven commands which are referred to in the VAMOSC sys-

tem as "relevant." The relevant commands are given in Table 8.

This allocation is incorrect since all of the costs should be

charged against the CMD/GELOC at which the aircraft is usually sta-

	Ratio Denominator	Assigned Value of p
*Aircrew	X, c, b	0.0 (possessed hours only)
Command Staff/Other	M, c, b	0.5
Security	S, c, b	0.0
POL	m, A, B	1.0 (flying hours only)
**Training Munitions	-	-
Replenishment Spares	m, A, B	0.5
Mod Kits	m, A, B	0.0
Depot Maintenance	m, A, B	0.5
General Depot Support	M, A, B	0.5
Depot Installation Spt.	M, A, B	0.5

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m = unique MDS

c = unique relevant command

b = unique GELOC

M = all MDSs

C = all relevant commands (AAC, ATC, MAC, PACAF, SAC, TAC, USAFE)

B = all GELOCS

S = all MDSs requiring security

A = all commands

X = all MDSs requiring crew with a unique AFSC

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*While these costs are not allocated with flying operations ratios directly, the allocation may be expressed in terms of a flying operations ratio.

**Training munitions are allocated to MDSs in proportion to aircrew.

Table 8: Definitions for Denominators for the WSSC Flying Operations Ratio by Cost Category

tioned (that is, the base from which the aircraft originated). For
example, the more time an aircraft spends at a depot, the less costs
are allocated to it in WSSC. This is very detrimental since presumably
an aircraft spending a lot of time at a depot-level repair facility
is undergoing extensive (and expensive) repairs, and this is when it
should have the most costs allocated to it.

1. Quantitative Analysis

The following analyses apply to any allocation in WSSC which
uses flying operations data. For WSSC reports at a particular
CMD/GELOC, the underallocation may be greater or lesser than the
worldwide averages which will be discussed.

Desmatics examined FY83 WSSC data to determine the effect of
AFLC possession on cost allocation. The aircraft possession and
flying data from the AVISURS interface (VC-48 format) [9] was sum-
marized by MDS and possessing command. Then three ratios were com-
puted based on this data. The three ratios used in this analysis
were FH/PH (p=.5), FH only (p=1), and PH only (p=0).

The denominator for each ratio was the AF-wide activity (total
FH and/or total PH) of each MDS; the portion of that time spent in
AFLC possession constituted the numerator. The ratios were computed
at the CMD/MDS level, thus allowing the effect of AFLC possession on
a given MDS at the worldwide level to be examined. The three dif-
ferent ratios were examined because FH/PH ratios are currently used

in WSSC and the other two (FH or PH) were recommended by Desmatics [14] to be used in place of FH/PH as was mentioned earlier in this section.

Using the FY83 data, AFLC FH/PH ratios were computed for 92 of the 98 MDSs on the WSSC MDS table (WC-34 format) [10] used to select depot maintenance costs from the WSCRS interface file. The six MDSs for which ratios could not be computed had either total FH or total PH equal to zero.

Desmatics also investigated how a change to FH or PH ratios would affect the problem of underallocation of costs. Desmatics computed AFLC FH and PH ratios from FY83 data. FH ratios could be computed for 92 of the 98 MDSs on the WSSC MDS Table (the remaining six MDSs had total FH of zero). PH ratios were computed for 96 of the 98 MDSs (two MDS had total PH of zero). The descriptive statistics for FH/PH ratios, FH ratios, and PH ratios are given in Table 9. The under-allocation percentages given indicate how much, on average, of the total cost for a cost category allocated with such a ratio would be allocated to AFLC because of depot possession of an MDS rather than to owning commands.

As can be seen, the FH ratios have a much smaller mean than either FH/PH or PH ratios. In fact, the underallocation problem is for all intents and purposes negligible for FH ratios. This is because an aircraft at a depot for repairs is flown very little by AFLC.

The PH ratios do much worse than either FH/PH or FH. This poor

	Ratio Type		
	FH/PH	FH	PH
Number of MDSs	92	92	96
Mean Underallocation	6.5%	0.2%	14.3%
Maximum Underallocation	38.3% (C-12A)	2.8% (RC-135J)	100.0% (F101B, F101F)
Minimum Underallocation	0.0% (10 MDSs)	0.0% (30 MDSs)	0.0% (12 MDSs)

Table 9: Summary of Underallocation for Flying Operations
Ratios Based on FY83 AVISURS Data.

performance can be explained by the influence of aircraft such as those which are given as extremes in Table 9. These aircraft, which appear in the WSSC MDS table, are possessed for the majority of the time by AFLC. In fact, the two F-101 series are possessed entirely by AFLC. This calls into question the usefulness of including such aircraft in the WSSC MDS table. If these aircraft are removed from the analysis, for example, the mean for the PH ratios drops to 10.7% of the total cost for a category allocated with such a ratio. The average under-allocation using the FH/PH ratio at the worldwide level is approximately 6.5% of the total cost for a category.

The true effect of this underallocation on WSSC, however, is less than these values for several reasons. First, a given MDS is usually possessed by both relevant and nonrelevant commands. The WSSC system is designed to portray the costs attributable to relevant command usage of an aircraft. As such, the underallocation of costs to a WSSC MDS is lessened by any nonrelevant command (i.e., other than AFLC) activity of that MDS.

The second factor which lessens the underallocation of costs to WSSC aircraft is AFLC possession of test and evaluation aircraft. Some aircraft of nearly every MDS are permanently stationed at the depots for test and evaluation purposes. These aircraft remain in AFLC possession the entire year. When aircraft of a given MDS from a relevant command go to the depot, their flying operations data is confounded with the test and evaluation aircraft data in current WSSC processing. Since WSSC is concerned with relevant commands, the underallocation

to an MDS is only that portion of the AFLC possession/flying time for an MDS attributable to relevant command aircraft in temporary ALC possession.

For these reasons, the percentages given earlier in this section represent the combined relevant/nonrelevant percentage of underallocation. To determine the portion of the underallocation attributable to the relevant commands would require extensive tracking of the individual aircraft in the AVISURS data, particularly their movements to and from the depot-level repair facilities (see also the additional comments later in this section).

The underallocation figures discussed in this section are "worst case" scenarios from the viewpoint of WSSC. The actual percentage of underallocation for a given MDS costed by the WSSC system would equal the one calculated by Desmatics only if: (1) the aircraft were not used in nonrelevant commands, and (2) the ALCs did not permanently possess some of the particular MDS. There are few, if any, aircraft which meet these criteria as "worst case" aircraft. In all other cases the extent of underallocation is smaller.

2. Evaluation

The exact level of the underallocation of costs to relevant command aircraft resulting from the use of flying operations ratios could not be determined without examining the detailed AVISURS records for each aircraft in the AF inventory. Desmatics considered it unnecessary

to do such a search, since the figures for the underallocation presented in this volume represent the "worst case" situation (no nonrelevant command ownership of an MDS, and no ALC test and evaluation aircraft of an MDS). Adequate judgements as to the degree of the problem can be made from such figures.

The current status of the WSSC algorithms which are based on flying operations ratios is given in Table 10. The proposed and/or in-process changes to these allocation algorithms are also given. The reader should notice the number of categories which are, and which will be, allocated by PH ratios. As discussed previously, these ratios result in the largest amount of cost underallocation. The ISRDs referred to in the table are those which have been submitted by the Office of VAMOSC as of the date of this volume.

In order to correct the problem of underallocation with PH ratios, one must know which aircraft are assigned to a base, rather than merely possessed by a base. The difference between these situations is subtle but important. An aircraft which is at a depot-level repair facility will come under the possession of AFLC while it is there, but it is assigned to the base from which it came. The Office of VAMOSC has brought to Desmatics' attention a data system which directly portrays the assigned data for aircraft. This system, called WSMIS (Weapon System Management Information System), provides a summary of AVISURS data in such a way as to make visible the difference between assigned and possessed aircraft at the CMD/GELOC/MDS level for all commands. According to the Office of VAMOSC, WSMIS is a contractor-operated sys-

WSSC Cost Category	Current Allocation	After Pending Changes (before this volume)
Aircrew	PH	PH
Command Staff/Other	FH/PH	PEC [4]
Aircraft Security	PH	PH
POL	FH	Direct (ISRD VAM-D85-006)
Training Munitions	PH*	PH*
Replenishment Spares	FH/PH	PH (ISRD VAM-D85-004)
Modification Kits	PH	Completions (ISRD VAM-D83-007)
Depot Maintenance	FH/PH	FH (ISRD VAM-D85-004)
Gen. Depot Support	FH/PH	PH (ISRD VAM-D85-004)
Dep. Installation Sup.	FH/PH	FH/PH

*This category allocated based on aircrew, which is based on PH.

Table 10: WSSC Algorithms Currently using Flying Operations Ratios, and Planned Enhancements to these Algorithms.

tem which provides various data interrogation capabilities to the Air Force via terminal equipment.

The Office of VAMOSC has provided Desmatics with a copy of an actual inventory summary from WSMIS, by CMD/GELOC/MDS. From this summary it is apparent that this data should provide a solution to the PH underallocation problem. The assigned inventory for an aircraft is consistently greater than or equal to the possessed inventory on this summary. Desmatics recommends that this higher assigned inventory figure replace PH as the allocation basis, for all allocations based on PH. In order to do this, the assigned aircraft data must be aggregated to the correct level for each cost category, as given in Table 8.

This should be a relatively straightforward procedure, as the Office of VAMOSC has indicated that the WSMIS system has data for all commands and this data may be summarized in a variety of ways. The assigned aircraft figure used for allocation should be the average assigned aircraft over the fiscal year, rather than the number of aircraft assigned at a given point in time. The Office of VAMOSC should determine whether such a product is available directly from the WSMIS system. If such a product is not available, this will require the Office of VAMOSC to collect the data throughout the year and compute an average.

In Desmatics' opinion, those allocations which are based on flying hours only should continue as is since their performance in terms of underallocation is satisfactory. Flying hours are relatively unaffected by AFLC possession of an MDS, as was demonstrated earlier in this section.

B. RELEVANT/ALL RATIO CALCULATION

While conducting its investigation of WSCRS, Desmatics observed
a processing error in WSSC's calculation of the relevant/all ratios
which are used to allocate WSCRS costs. The problem occurred in FY83
with seven MDSs which had no flying hours (FH) reported in the Aero-
space Vehicle Inventory Status and Utilization System (AVISURS), G033B.
Generally these MDSs also had under 8760 possessed hours (PH), which
is less than one average aircraft, but in the case of the QF100D
there were 57,006 possessed hours (6.51 average aircraft). While it
may be noted that the QF100D is a drone, it nevertheless is an MDS
reported in FY83 in the WSSC USAF History File, in AVISURS, and in
WSCRS.

In the case of the seven MDSs having no flying hours in FY83,
the result of the processing error was to understate depot maintenance
costs by 50%. For example, WSCRS reported a total of $1,732,550 depot
maintenance costs for the QF100D in the eleven categories which WSSC
currently uses. The PH ratio was 1.0, indicating that in FY83 all
QF100Ds were in relevant commands. However, since there were no flying
hours reported in AVISURS for this MDS, the numerator and denominator
of the flying hour ratio were both zero, resulting in a mathematically
undefined quantity.

It is apparent that WSSC processing routines set the flying hour
ratio equal to 0.0, with the result that the relevant/all ratio was
computed to be 0.5. Intuitively, this ratio should have been 1.0,

because all depot maintenance costs for this MDS were for relevant

command aircraft. The result was an understatement amounting to

$866,275 for the QF100D.

Similar but smaller understatements occurred in FY83 for the

C20A, QF100F, QF102A, TF102A and YQF100D. The same sort of ratio

occurred for the F100F, but since no depot costs were reported in

FY83 by WSCRS the processing error had no cost impact.

In its Technical Report No. 115-2 [5], Desmatics pointed out

that the allocation ratios based on flying hours and possessed hours

used by WSSC were mathematically faulty, and recommended that they

be replaced by forms that are mathematically consistent. The Office

of VAMOSC concurred in that recommendation, but the change has not

yet been accomplished. In addition Desmatics reported in Technical

Report No. 115-2 [5] that two-step allocations involving the relevant/

all ratio also produced incorrect results. A recommendation to change

all two-step allocations to one-step has not yet been implemented.

Use of the consistent ratio in a one-step process, as recommended

by Desmatics [5], would eliminate the understatement caused by

faulty calculation of the relevant/all ratio. This would eliminate

the need for relevant/all ratios and would produce mathematically

correct allocations.

C.   THE MDS TABLE

In selecting cost records from the WSCRS WBS Summary File, WSSC

uses a table of MDSs supplied by the Office of VAMOSC. This table not only provides a means for eliminating missile cost data from input to WSSC, but also establishes a way to exclude depot costs for aircraft MDSs which may not be considered suitable for inclusion in the WSSC History data base.

As part of its investigation of WSCRS, Desmatics reproduced the processing used for FY83 depot data. Using the MDS Table File (Format C-42 [10]), the WBS Summary File (C-59), and the MDS Relevant/All Ratio File (C-34), Desmatics computed depot costs for all MDSs in the table. Samples of these were then compared with costs reported in the FY83 WSSC AF History File (C-83).

It was noted that nine of the MDSs in the FY83 History File had no depot costs. This was traced to the fact that these MDSs were not in the MDS Table. The nine were: C135E, EC130H, KC135E, QF100D, TR001A, TR001B, UH060A, NKC135A and NKC135E. The total relevant command share of the depot maintenance costs for these MDSs was $7.55 million within the eleven cost categories currently included by WSSC.

Desmatics recommends that the Office of VAMOSC review the procedures for preparing and applying the MDS Table to insure that WSSC selects depot costs from WSCRS for all MDSs intended to be included. If it is desired that certain MDSs be excluded from WSSC, then the MDS Table should be applied to all flying operations ratio files which drive WSSC processing, rather than to the WSCRS WBS Summary File alone.

VI. CONCLUSIONS, RECOMMENDATIONS AND OFFICE OF VAMOSC COMMENTS

This volume has presented Desmatics' evaluation of the Weapon System Cost Retrieval System (WSCRS), DSD HO36C. This system provides depot maintenance and condemnation costs to the WSSC subsystem of VAMOSC. Desmatics' evaluation has focused on the appropriateness of the data supplied by WSCRS to the WSSC system. This particular task is a follow-on to Desmatics' validation and verification effort for the WSSC system.

A. SUMMARY

The WSCRS system provides to WSSC an annual summary file of depot maintenance and replenishment spares costs by Mission Design Series (MDS) and Work Breakdown Structure (WBS). The costs in WSCRS are developed based on data extracted from other Air Force data systems. The WSCRS system must employ cost allocation methods to arrive at MDS-level costs since most of the data is for lower-level components of an MDS. Desmatics has found the procedures used by WSCRS for cost calculation and allocation to be intuitively reasonable and valid.

In Desmatics' opinion, the WSSC system is not providing a complete portrayal of the total cost of aircraft depot maintenance. This results from the fact that the WSSC system selects from the WSCRS file only those costs which are funded by the Depot Maintenance In-

dustrial Fund (DMIF). Desmatics believes that both DMIF-funded and unfunded costs should be included in WSSC to give a complete depiction of depot maintenance costs.

The method proposed by the Office of VAMOSC to provide separate visibility of modification labor costs has several drawbacks, in Desmatics' opinion. Desmatics has proposed an alternative method of obtaining this cost visibility. The method suggested by Desmatics would make use of WSCRS data, rather than establishing a new interface, as would be required under the Office of VAMOSC method.

Desmatics recommends the elimination of two WSSC cost categories, Depot Installation Support and General Depot Support, and replacement with costs obtainable from the WSCRS system, as outlined in the text. The WSCRS costs should replace the costs currently developed by WSSC for these two categories for two reasons: (1) the costs from WSCRS would include the DMIF funded portion which WSSC does not obtain, and (2) the costs from WSCRS are already allocated to the MDS level, which would simplify WSSC processing.

Desmatics further recommends that WSSC obtain the costs for several additional material categories from the WSCRS system to allow for a more complete costing in the Sustaining Investment category. Desmatics provides suggested revised formats for both the CAIG and USAF Detail reports which incorporate all of the previously-mentioned changes.

Desmatics has found that possessed hour ratios and combined flying hour/possessed hour ratios tend to underallocate costs to the aircraft in WSSC due to possession of these aircraft by Air Force Logistics Com-

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mand when such planes are receiving depot-level maintenance. Desmatics suggests the use of assigned aircraft data available to WSSC to alleviate this underallocation problem.

In summary, Desmatics considers WSCRS to be a satisfactory source of data for the WSSC system. The WSSC system can improve its presentation of depot costs by making full use of the cost information provided it by the WSCRS system.

B. RECOMMENDATIONS AND REPLIES

What follows are Desmatics' conclusions and recommendations regarding the WSCRS system interface with the WSSC system, and the manner in which WSSC uses and presents depot maintenance and condemnation costs. The responses of the Office of VAMOSC are appended to each recommendation.

1. WSCRS Condemnation Cost (See pages 10-11)

Conclusion: The condemnation cost data supplied to WSSC by WSCRS is based on D041 unit prices. These prices may not be representative of true replacement costs for a variety of reasons. However, this is the only source of such data in the Air Force.

Recommendation: The Office of VAMOSC should continue to use the condemnation costs supplied by the WSCRS system. However, a statement explaining the constraints of this data should be added to the algorithm explanation section of the WSSC User's Manual.

Office of VAMOSC Comments: "Concur. An explanation will be added to the WSSC User's Manual describing the constraints of this source of data."

2. Addition of WSCRS Cost Elements to Depot Maintenance (See pages 21-24)

Conclusion: Depot Maintenance costs are currently understated in the WSSC system because not all relevant WSCRS cost elements are included in the Depot Maintenance cost category.

Recommendation: The Office of VAMOSC should add the following cost elements to the depot maintenance cost category as indicated in the text:

Unfunded Other Direct Cost
Unfunded Operations Overhead
Unfunded Government-Furnished Services
Unfunded General and Administrative Expense
Funded General and Administrative Expense

Office of VAMOSC Comments: "Concur in part. We agree that costs not paid for by the Depot Maintenance Industrial Fund should also be portrayed by the WSSC system. However, there is currently some question on the possibility of double costing using unfunded costs with WSCRS and H069R. The Office of VAMOSC will investigate this along with Desmatics."

3. Modification Labor Costs from WSCRS (See pages 24-25)

Conclusion: By obtaining modification installation costs from the G079 system and subtracting them from the WSCRS depot maintenance cost data, there is a possibility of obscuring the cost visibility currently provided by WSCRS.

Recommendation: Instead of using the proposed G079 interface, the Office of VAMOSC should provide separate visibility for modification installation costs using the WSCRS records with a record code suffix of H.

Office of VAMOSC Comments: "Concur. Instead of using the proposed G079 interface, we will use the WSCRS cost elements with a record code of H for the Modification Installation line item."

4. CLS Funded by the Operational Commands (See pages 25-26)

    Conclusion: The Contractor Logistics Support (CLS) line item
    in the Depot Maintenance cost category reflects only CLS which
    is funded by AFLC. CLS which is funded by the operational
    commands is not available in the WSCRS system. Desmatics is
    investigating the possibility of identifying these costs to
    aircraft via the HO69R system.

    Recommendation: The Office of VAMOSC should indicate in the
    WSSC documentation the current constraints on displaying CLS
    in the Depot Maintenance cost category.

    Office of VAMOSC Comments: "Concur. The Office of VAMOSC will
    indicate in the WSSC documentation that the Contractor Logistics
    Support (CLS) line in the Depot Maintenance cost category
    reflects only CLS funded by AFLC."

5. Funded Maintenance Support Costs (See page 26)

    Conclusion: WSSC currently selects the cost element of Funded
    Maintenance Support for the depot maintenance cost category,
    but Department of Defense guidelines indicate that maintenance
    support costs should not be included in the cost of depot
    maintenance. They should be classified as depot non-maintenance,
    instead. Even though WSCRS passes no dollar amounts for this
    cost element to the WSSC system, WSSC users may believe these
    costs are included since there is no separate visibility for
    funded maintenance support on the WSSC output products.

    Recommendation: The Office of VAMOSC should eliminate Funded
    Maintenance Support Costs from the current WSCRS depot main-
    tenance selection criteria as these are depot non-maintenance
    costs. Although no costs are currently reported to WSSC for
    this element, its inclusion is misleading to WSSC users.

    Office of VAMOSC Comments: "Concur. The Office of VAMOSC
    will eliminate Funded Maintenance Support Costs from the cur-
    rent WSCRS depot maintenance selection criteria."

6. Additional Line Items for CAIG Depot Maintenance Format (See pages 26-27)

Conclusion: The cost of direct labor for depot maintenance is currently obscured on the CAIG report format by the inclusion of overhead and other indirect costs in the Labor line item.

Recommendation: The Office of VAMOSC should add line items to the organic and contract depot maintenance costs entitled "Other." All elements which are not direct labor should be included in this line item as illustrated in the text.

Office of VAMOSC Comments: "Concur. We agree that this format could make the CAIG report format more meaningful to WSSC users. An additional ISRD to compliment VAM-D85-024 will be submitted incorporating these changes. However, as mentioned in Recommendation 2, unfunded costs will have to be investigated."

7. Incomplete Costing of Consumption Spares (See page 30)

Conclusion: The CAIG definition of Replenishment Spares includes the procurement cost of additional stock levels. In addition, spares may be issued without an accompanying turn-in or condemnation. The current WSSC algorithm for Consumption Spares computes a cost only when there has been a condemnation.

Recommendation: The Office of VAMOSC should indicate the constraints of the current algorithm in the User's Manual.

Office of VAMOSC Comments: "Concur. We will make the necessary changes in the WSSC User's Manual."

8. <u>Modification Kit Costs from WSCRS</u> (See pages 31-33)

Conclusion: Modification kit material costs can be obtained more easily through the existing WSCRS interface than through the proposed G079 interface with no loss of accuracy.

Recommendation: The Office of VAMOSC should use the WSCRS cost elements of Unfunded Direct Material - Modification Kits and Government-Furnished Material - Modifications in place of the proposed G079 interface for the Modification Kit line item in the category of Sustaining Investment.

Office of VAMOSC Comments: "Concur. The Office of VAMOSC will use the WSCRS cost elements of Unfunded Direct Material - Modification Kits and Government Furnished Material - Modification in place of the proposed G079 interface."

9. <u>WSCRS Cost Elements in Place of Depot Installation Support</u> (See pages 32,34)

Conclusion: The WSCRS cost elements of Funded and Unfunded General and Administrative Expense are a more complete source of Depot Installation Support costs than the H069R data currently being used. Additionally, WSCRS cost elements are identified to MDSs whereas the H069R data must be allocated by WSSC to this level.

Recommendation: The Office of VAMOSC should replace depot installation support costs from H069R with the General and Administrative Expense cost elements (funded and unfunded) from WSCRS. This will simplify WSSC processing and provide more complete costing.

Office of VAMOSC Comments: "Concur. The Office of VAMOSC agrees that this recommendation will provide more accurate costing of Depot Installation Support. However, two areas will require further research. As stated earlier, unfunded costs must be checked for double costing with H069R. Additionally, a determination must be made on whether or not general and administrative expenses constitue fixed overhead expenses."

10. **Elimination of Depot Installation Support (See pages 32,34)**

     Conclusion: Depot Installation Support costs are really over-
head expenses of the depot maintenance activity. As such they
should be included with other types of overhead costs in the
category of Depot Maintenance on the WSSC output products.
These types of costs for contract depot maintenance are cur-
rently included in the WSSC Depot Maintenance Cost Category.

     Recommendation: The Office of VAMOSC should eliminate the
Depot Installation Support category on the WSSC output products
and include Funded and Unfunded General and Administrative
Expense with other overhead expenses in the Depot Maintenance
category.

     Office of VAMOSC Comments: "Concur. If recommendation #9
proves suitable, then we will list Depot Overhead Expenses
under the Depot Maintenance category."

11. **Maintenance Support Costs (See pages 34-35)**

     Conclusion: The cost elements of Funded and Unfunded Organic
Maintenance Support are a better source of General Depot Sup-
port costs than the HO69R data currently being used.

     Recommendation: The Office of VAMOSC should replace the General
Depot Support costs from HO69R with the elements of Funded and
Unfunded Maintenance Support from the WSCRS system. Although
WSCRS does not report these costs, the WSCRS OPR has indicated
that it should be possible for WSCRS to allocate them via the
FSC Factor and pass them along to the WSSC system.

     Office of VAMOSC Comments: "Concur. It is feasible to build
our General Depot Support costs from these elements. It will
require some restructuring in the WSCRS format. This will be
a future venture between our two offices."

12. Flying Operations Ratio Usage (See pages 44-45)

Conclusion: The use of flying operations allocation ratios in the WSSC system tends to underallocate costs to relevant command aircraft. This results from the fact that aircraft are recorded in AVISURS as being possessed by Air Force Logistics Command when these planes are at a depot or contractor repair facility. The type of allocation most affected by AFLC possession is that based on possessed hours.

Recommendation: The Office of VAMOSC should investigate the assigned aircraft data presented by the WSMIS system as a replacement for possessed aircraft data in those algorithms which utilize PH as the allocation basis. The method using this data is outlined in the text.

Office of VAMOSC Comments: "Concur. The Office of VAMOSC will investigate the possibility of an interface with the WSMIS system."

13. MDS Table Maintenance and Application (See pages 56-57)

Conclusion: In FY83 the MDS Table used by WSSC to select depot cost records from the WSCRS WBS Summary File did not have entries for nine MDSs which were in the AF History File, in the WSCRS WBS Summary File, and in AVISURS. This resulted in an understatement of $7.55 million in the depot maintenance costs reported by WSSC.

Recommendation: The Office of VAMOSC should insure that all desired MDSs are included in the MDS Table. If the intent is to use the MDS Table to exclude certain MDSs from WSSC, then the MDS Table also should be applied elsewhere in the processing to insure complete exclusion of all data for such MDSs.

Office of VAMOSC Comments: "Concur. We will manually verify the MDSs included on the table."

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This volume documents the findings of a study conducted by Desmatics for the Air Force Office of VAMOSC, assessing the suitability of the Weapon System Cost Retrieval System (WSCRS), H036C, as the source of depot maintenance and consumption spares cost information for use in the VAMOSC system. Desmatics concludes that WSCRS constitutes a satisfactory source of cost information in these areas. However, a number of recommendations are proposed to the Office of VAMOSC to improve the use made of WSCRS data in determining the depot maintenance and consumption spares costs of AF aircraft for display in the Weapon System Support

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